FIG. 1

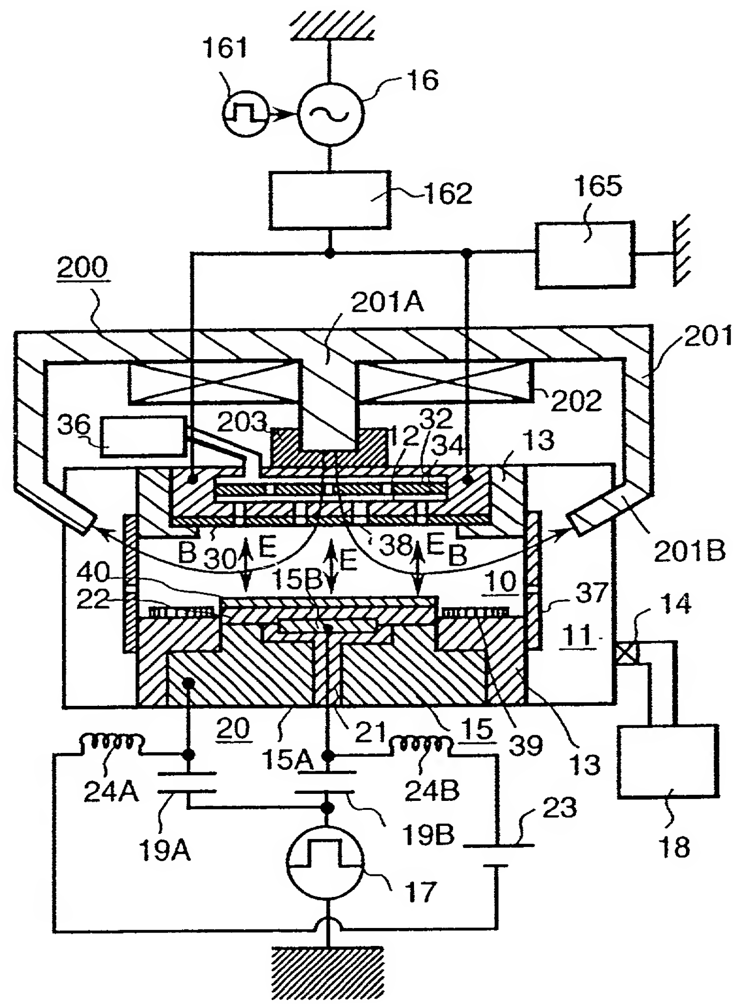

161
16
162
165
200
201A
201
202
36
203
32
12
34
13
201B
B
30
E
15B
E
38
E
B
10
40
22
37
14
11
20
21
15
39
13
15A
24A
24B
23
18
19A
19B
17

FIG. 2

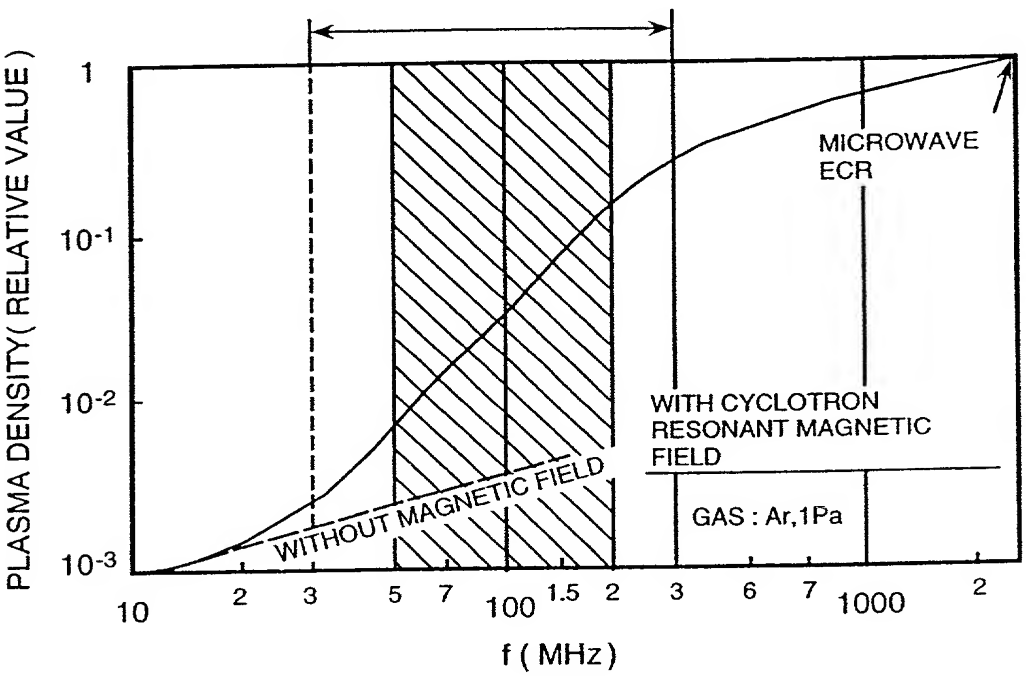
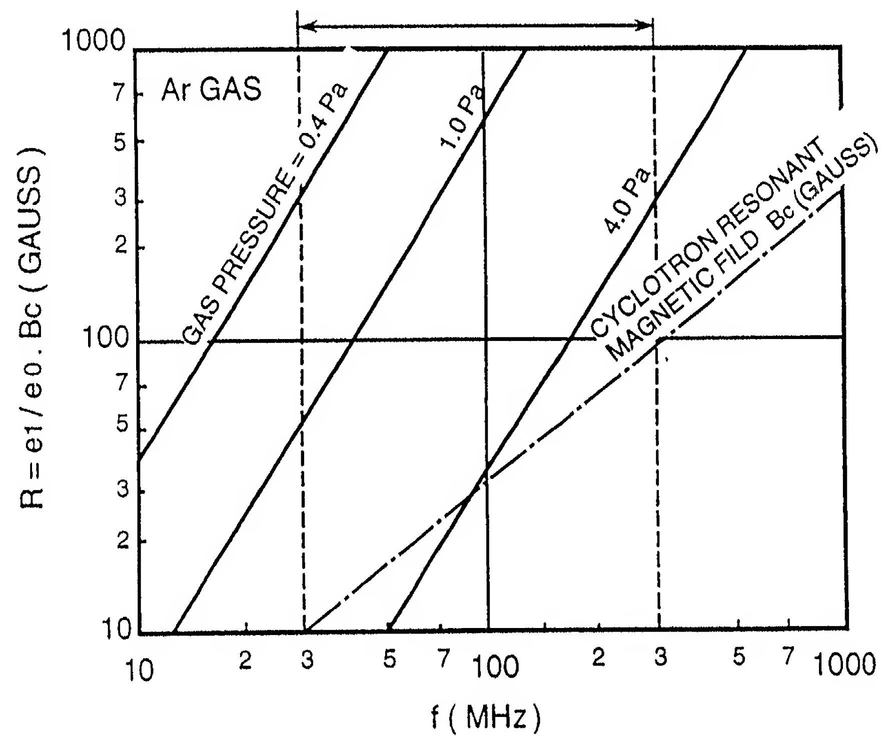

PLASMA DENSITY(RELATIVE VALUE)
1
10-1
10-2
10-3
10
2
3
5
7
100
1.5
2
3
6
7
1000
2
f (MHz)
MICROWAVE
ECR
WITH CYCLOTRON
RESONANT MAGNETIC
FIELD
WITHOUT MAGNETIC FIELD
GAS : Ar,1Pa

FIG. 3



$$Bc = 2\pi f \cdot \frac{m}{e}$$

e0 : ENERGY OBTAINED BY ELCTRON DURING ONE CYCLE OF RF UNDER CONDITION WITHOUT MAGNETIC FIELD

e1 : ENERGY OBTAINED BY ELCTRON DURING ONE CYCLE OF RF UNDER CONDITION APPLIED WITH CYCLOTRON RESONANT MAGNETIC FIELD

FIG. 4

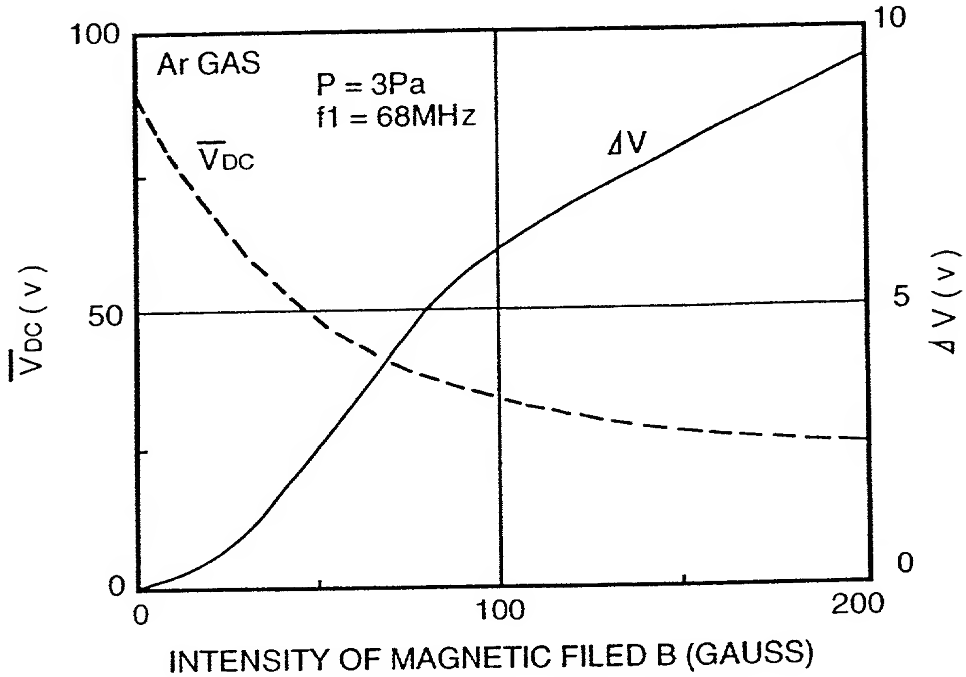

100
50
0
10
5
0
Ar GAS
P = 3Pa
f1 = 68MHz
$\overline{V}_{DC}$
ΔV
$\overline{V}_{DC}$ (V)
Δ V (V)
0
100
200
INTENSITY OF MAGNETIC FILED B (GAUSS)

FIG. 5

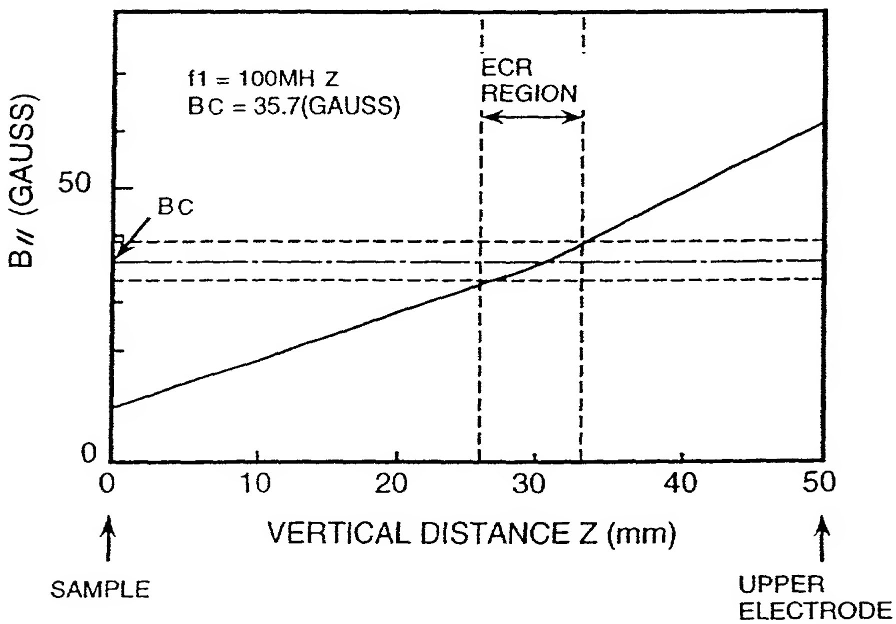

f1 = 100MH Z
BC = 35.7(GAUSS)
ECR
REGION
B// (GAUSS)
50
0
BC
0
10
20
30
40
50
VERTICAL DISTANCE Z (mm)
SAMPLE
UPPER
ELECTRODE

FIG. 6

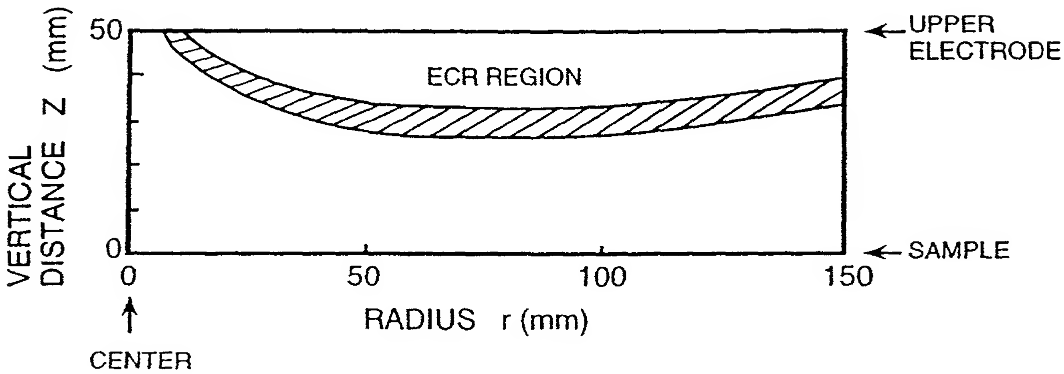

VERTICAL
DISTANCE Z (mm)
50
0
ECR REGION
UPPER
ELECTRODE
SAMPLE
0
50
100
150
RADIUS r (mm)
CENTER

FIG.7(A)

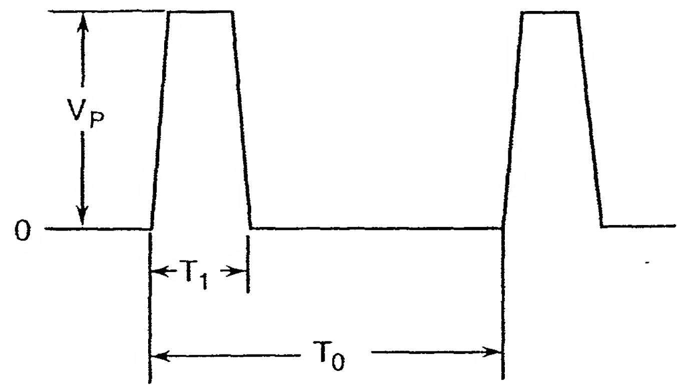
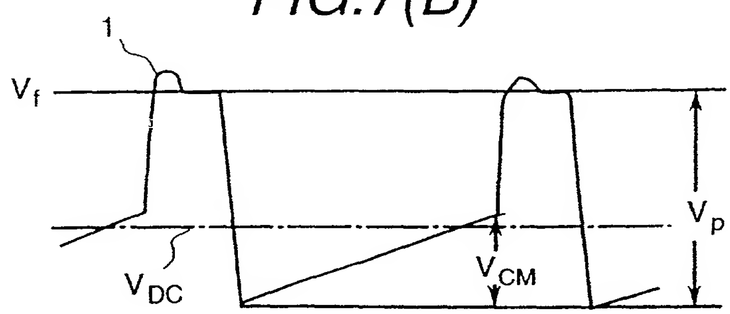


FIG.7(B)



$$V_{CM} = \frac{q}{c} = \frac{i_i \cdot (T_0 - T_1)}{(\varepsilon_\gamma \varepsilon_0 / d) \times K}$$

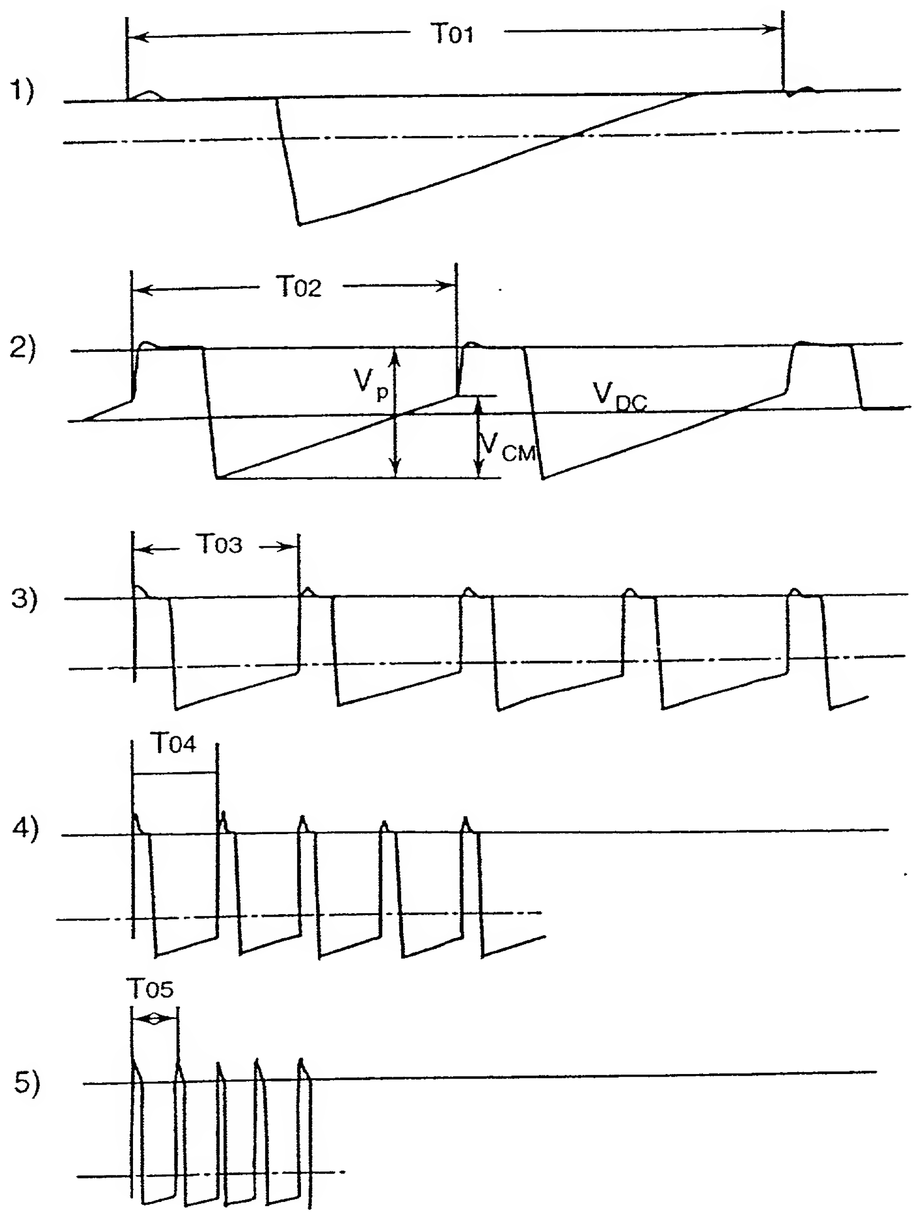
i_i : ION CURRENT DENSITY

ε_γ : SPECIFIC DIELECTRIC CONSTANT OF ELECTROSTATIC ATTRACTING FILM

d : THICKNESS OF ELECTROSTATIC ATTRACTING FILM

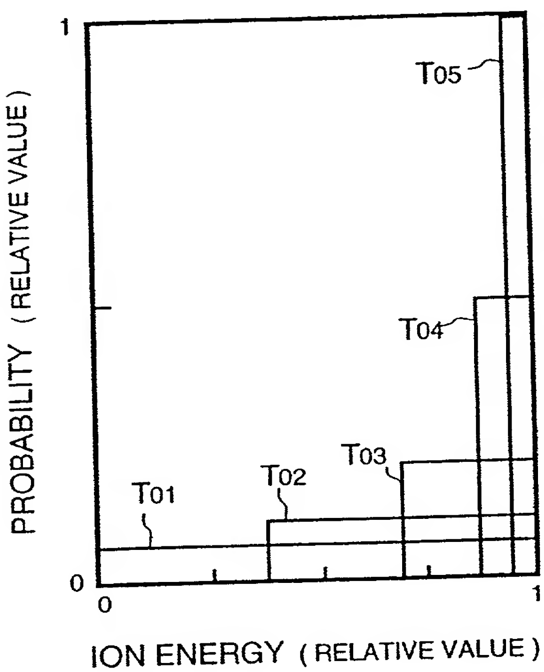
K : ELECTRODE COVERING RATIO OF ELECTROSTATIC ATTRACTING FILM

FIG. 8



T01 : T02 : T03 : T04 : T05 = 16 : 8 : 4 : 2 : 1

FIG. 9



1
T05
T04
T03
T02
T01
0
0
1
PROBABILITY (RELATIVE VALUE)
ION ENERGY (RELATIVE VALUE)

FIG. 10

$$V_{CM} = \frac{q}{c} = \frac{i_i \cdot (T_0 - T_1)}{(\varepsilon_r \varepsilon_0 / d) \times K}$$

REFERENCE CONDITION $\begin{cases} i_{i0} = 5\text{mA/cm}^2 \\ \varepsilon_{r0} = 10 \\ d_0 = 0.3\text{mm} \\ K_0 = 0.5 \end{cases}$

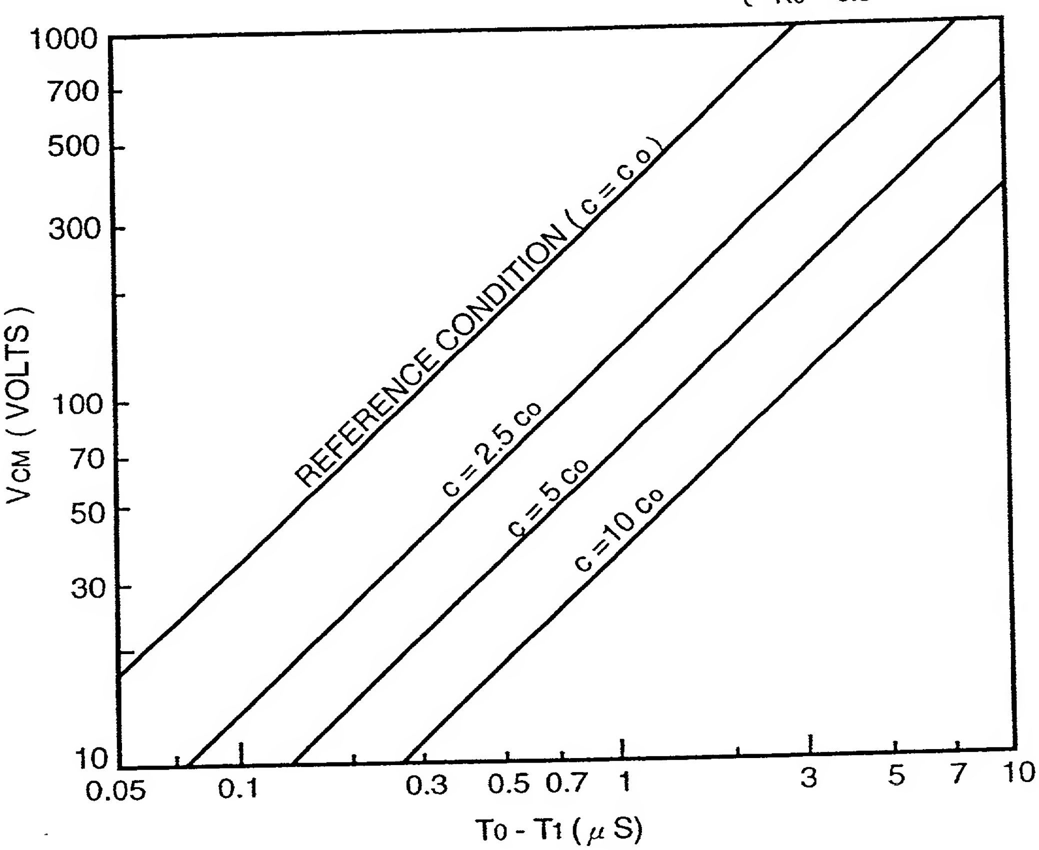


FIG. 11

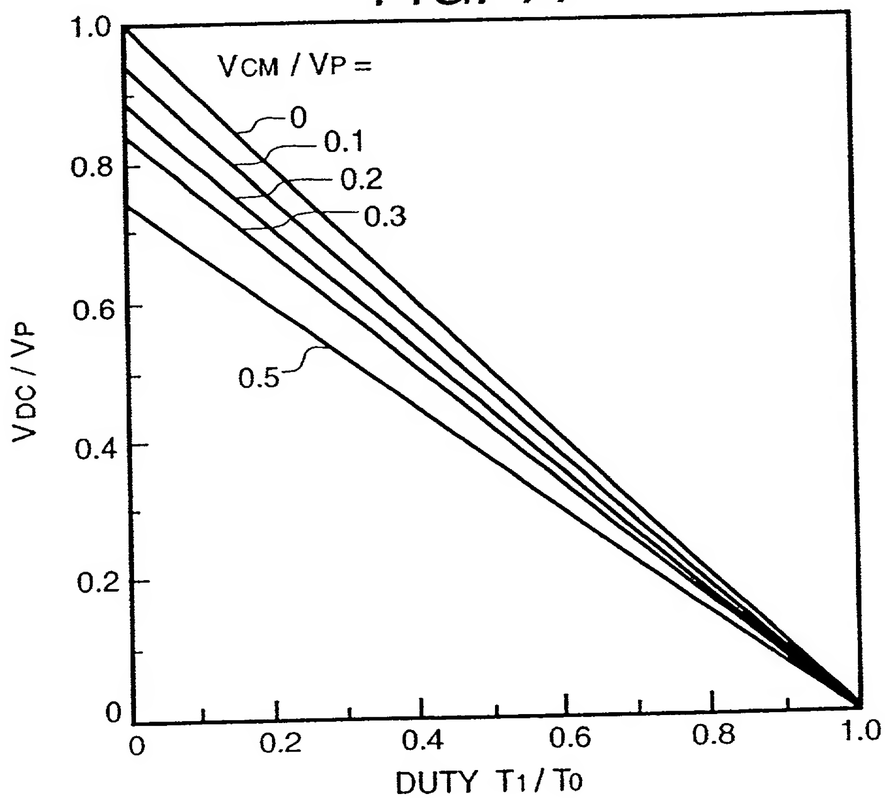

VCM / VP =
0
0.1
0.2
0.3
0.5
VDC / VP
1.0
0.8
0.6
0.4
0.2
0
0
0.2
0.4
0.6
0.8
1.0
DUTY T1 / T0

FIG. 12

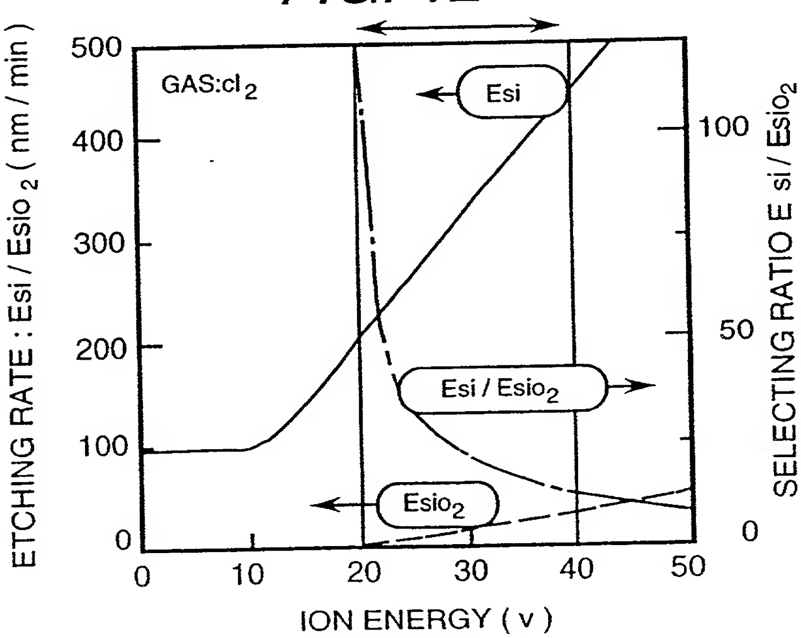

GAS:cl2
Esi
Esi / Esio2
Esio2
ETCHING RATE : Esi / Esio2 (nm / min)
SELECTING RATIO E si / Esio2
500
400
300
200
100
0
100
50
0
0
10
20
30
40
50
ION ENERGY (v)

FIG. 13

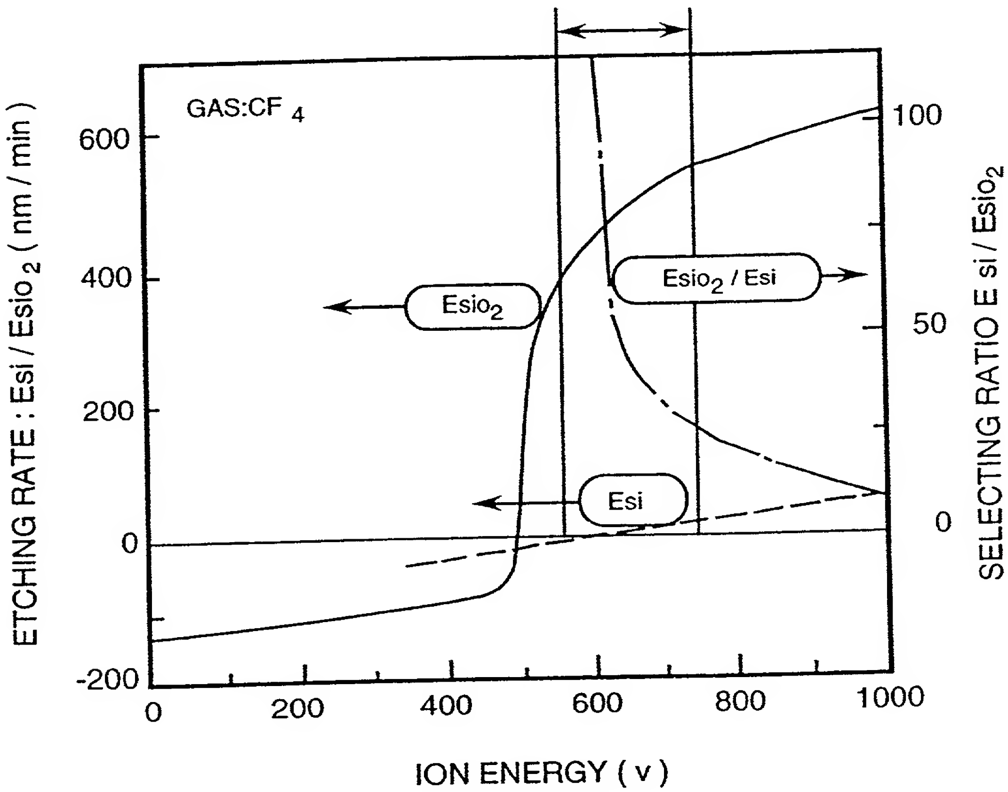
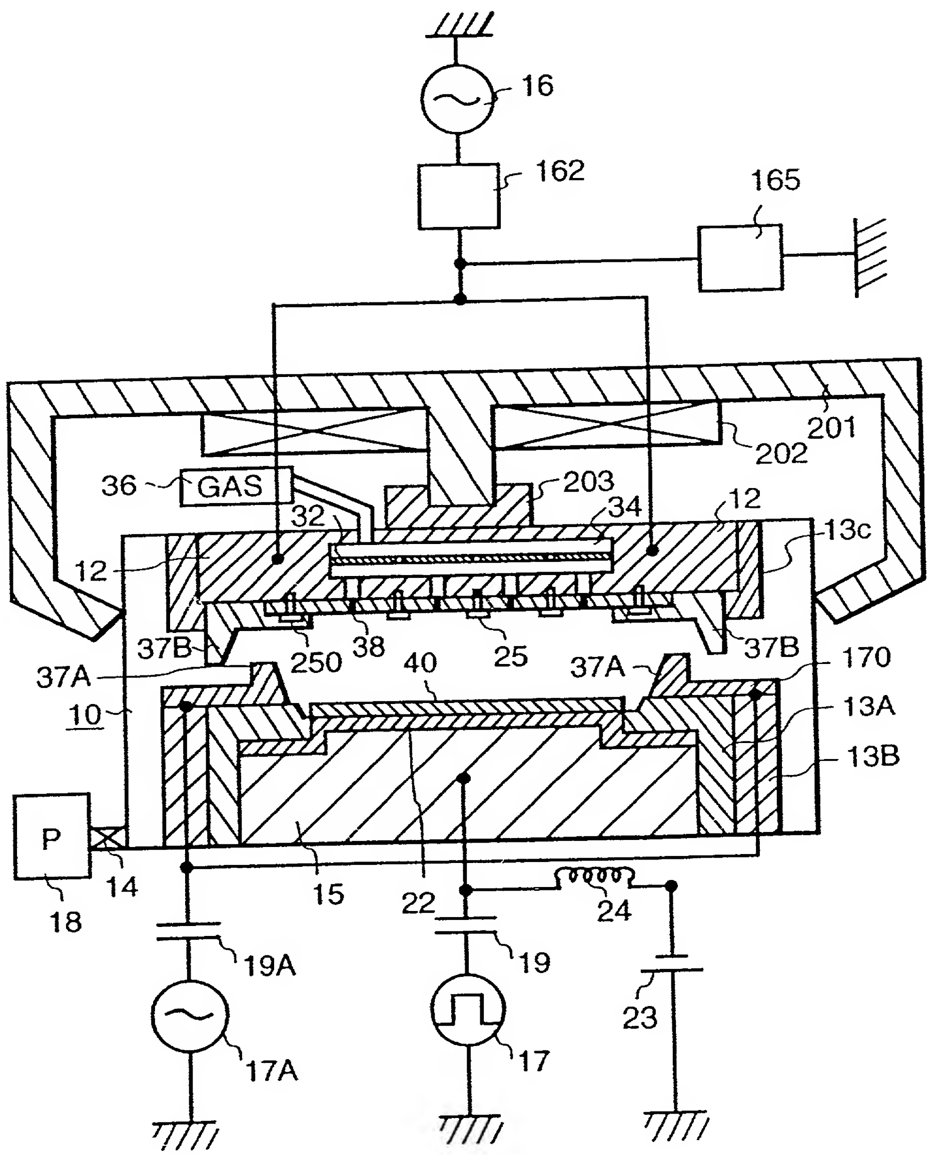

GAS:CF 4
600
400
200
0
-200
0
200
400
600
800
1000
100
50
0
Esio2
Esio2 / Esi
Esi
ETCHING RATE : Esi / Esio2 (nm / min)
SELECTING RATIO E si / Esio2
ION ENERGY (v)

FIG. 14



16
162
165
201
202
203
GAS
36
32
34
12
13c
12
37B
250
38
25
37B
170
37A
40
37A
10
13A
13B
P
14
15
22
24
18
19A
19
23
17A
17

FIG. 15

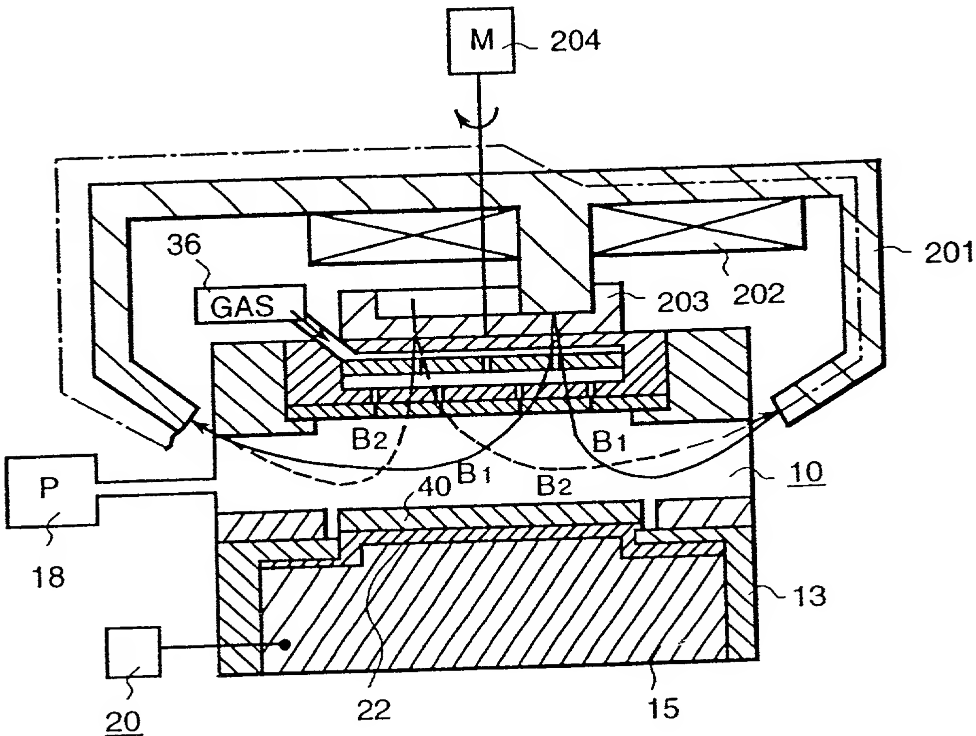

M
204
201
36
GAS
203
202
B2
B1
40
B1
B2
10
P
18
13
20
22
15

FIG. 16

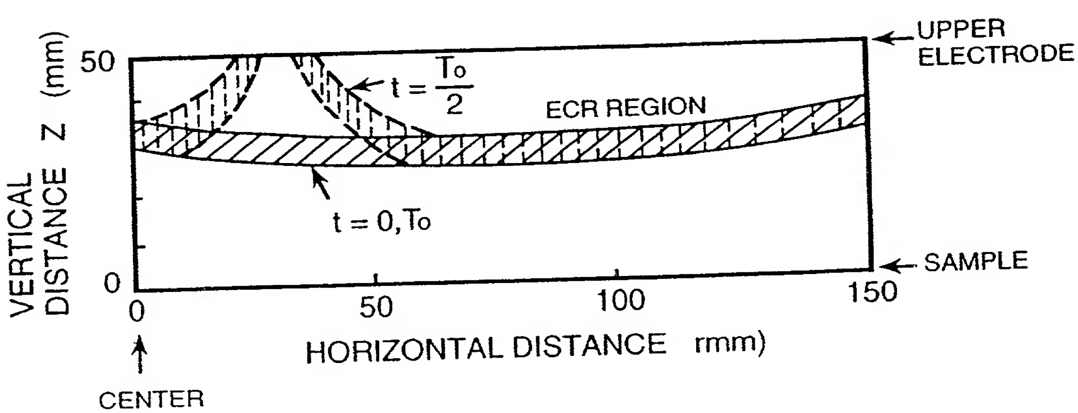

UPPER ELECTRODE
$t = \frac{T_o}{2}$
ECR REGION
$t = 0, T_o$
SAMPLE
VERTICAL DISTANCE Z (mm)
50
0
0
50
100
150
HORIZONTAL DISTANCE rmm)
CENTER

FIG. 17

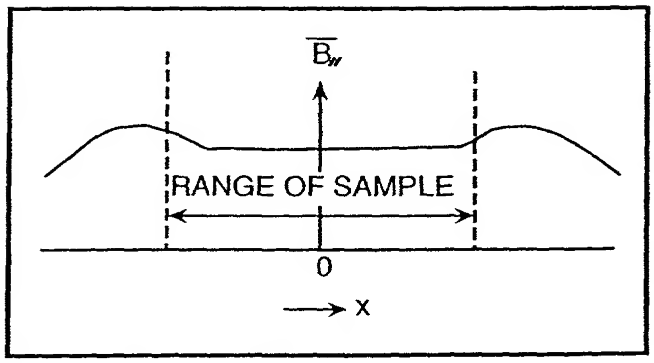

$\overline{B}_{//}$
RANGE OF SAMPLE
0
x

FIG. 18

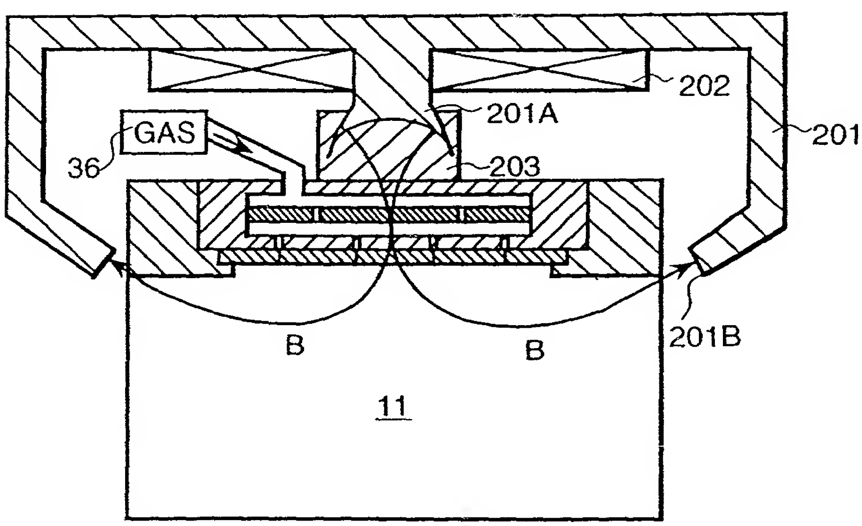

202
201A
GAS
201
36
203
B
B
201B
11

FIG. 19

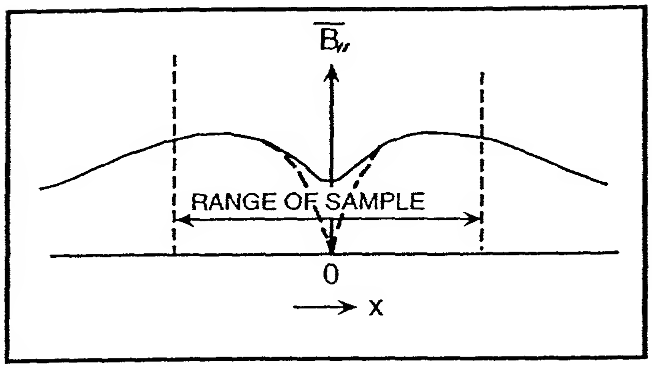

$\overline{B_{//}}$
RANGE OF SAMPLE
0
x

FIG. 20

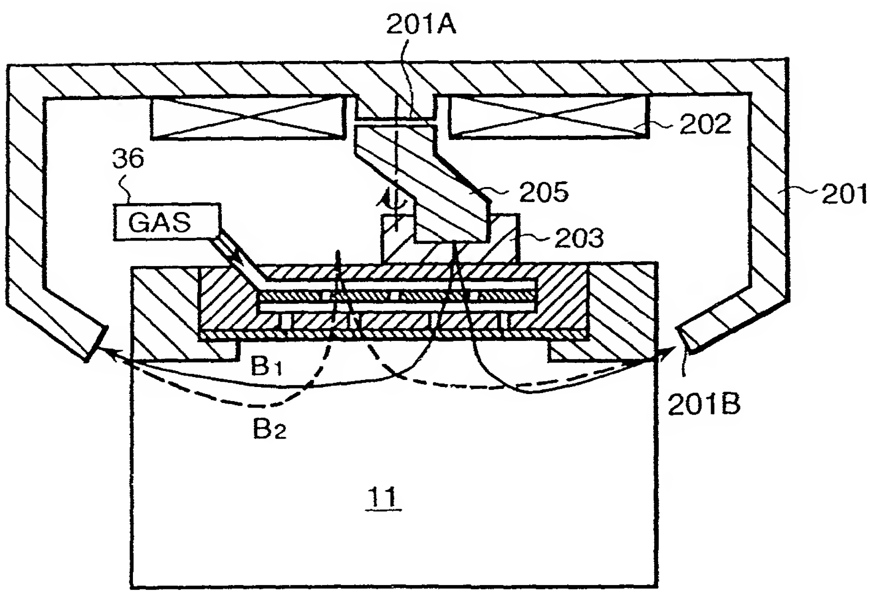

201A
202
36
GAS
205
201
203
B1
B2
201B
11

FIG. 21

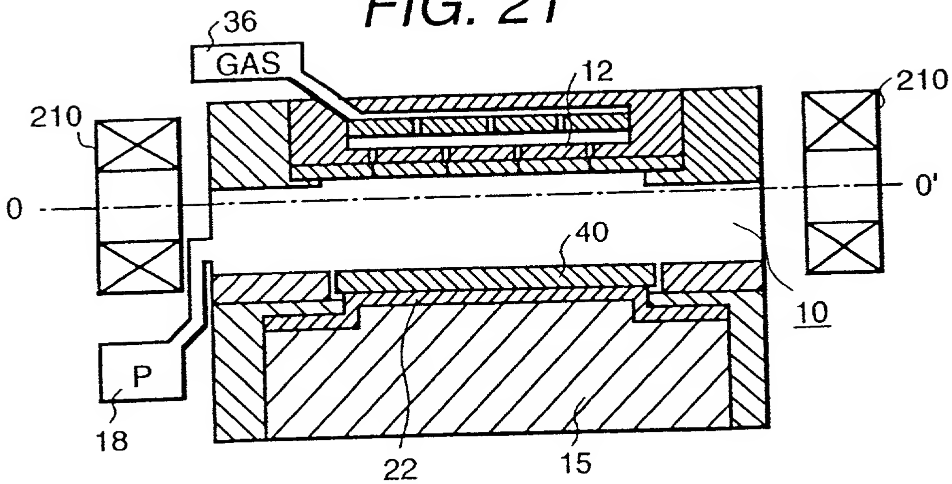

36
GAS
12
210
210
0
0'
40
10
P
18
22
15

FIG. 22

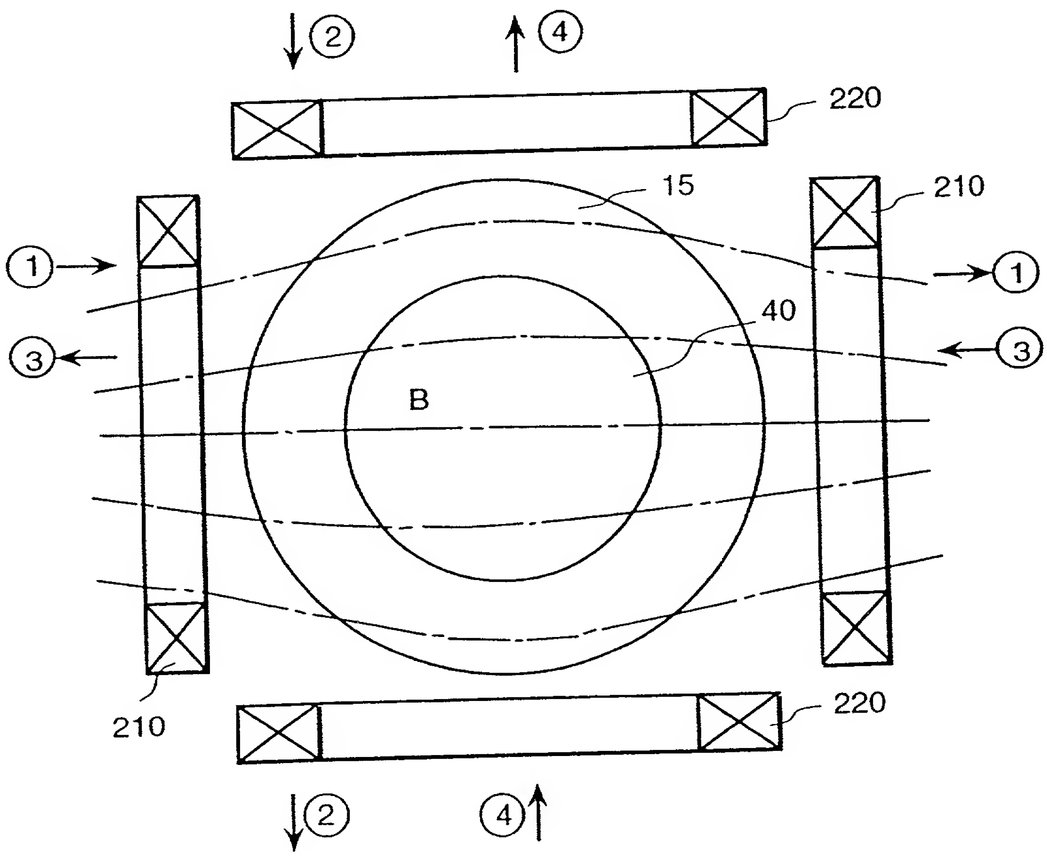

2
4
220
15
210
1
1
40
3
3
B
210
220
2
4

FIG. 23

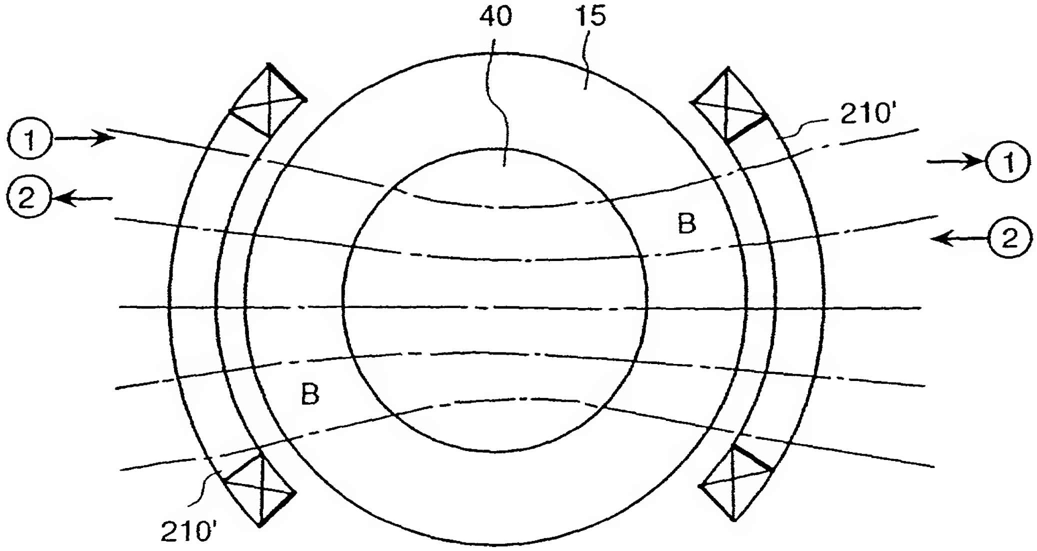


FIG. 24

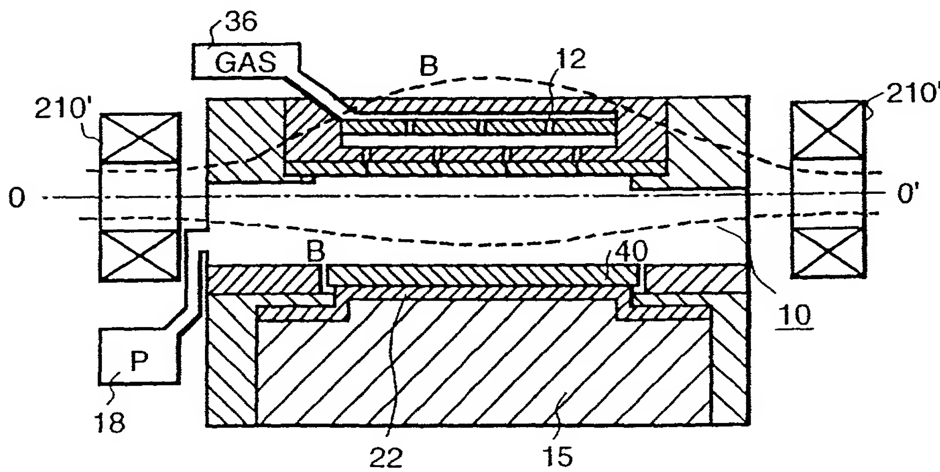


FIG. 25

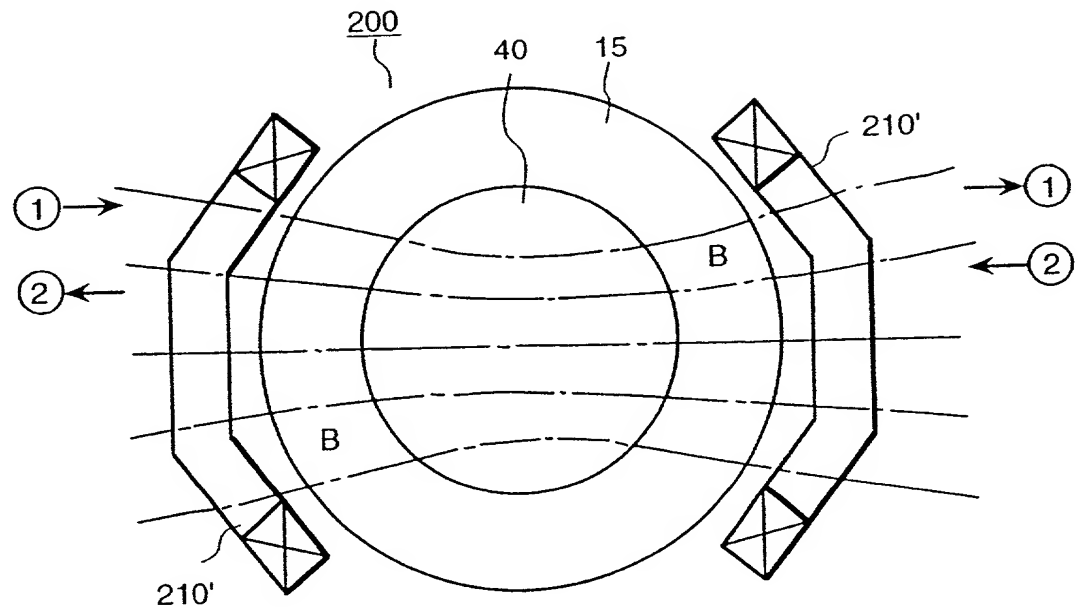


FIG. 26

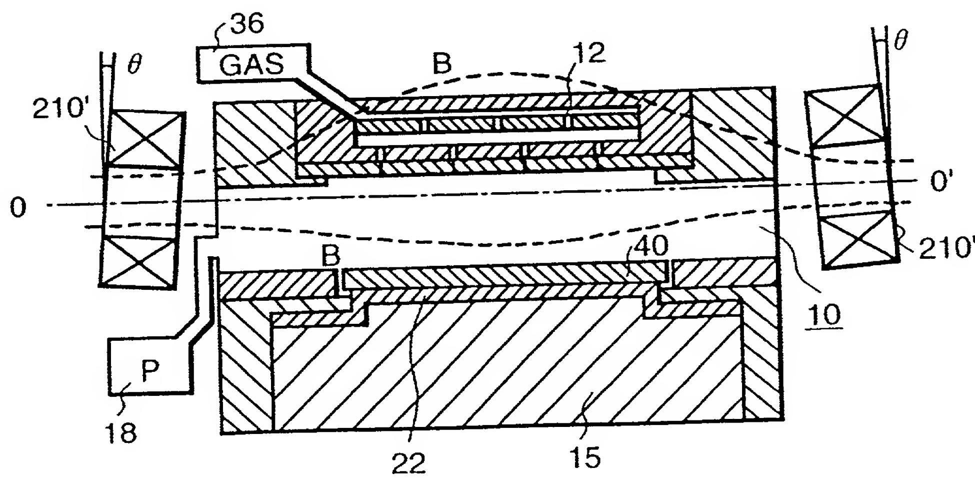


FIG. 27

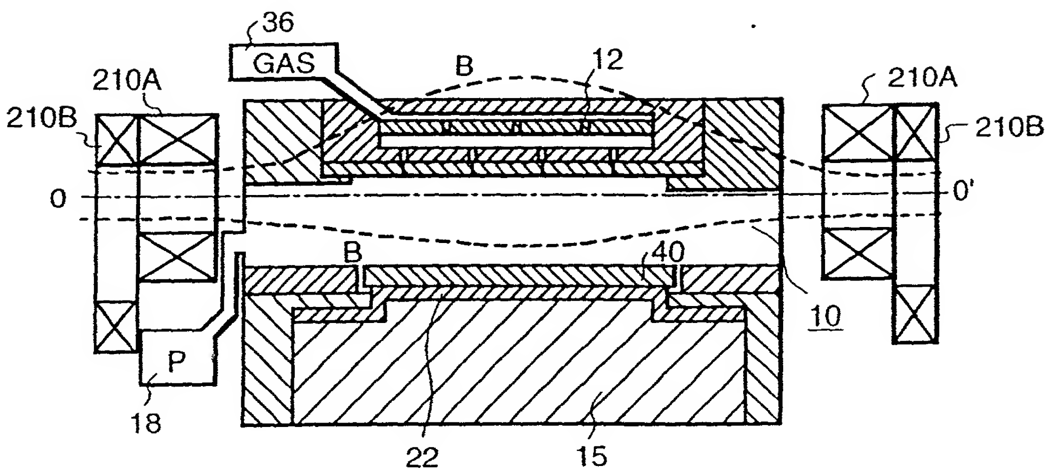


FIG. 28

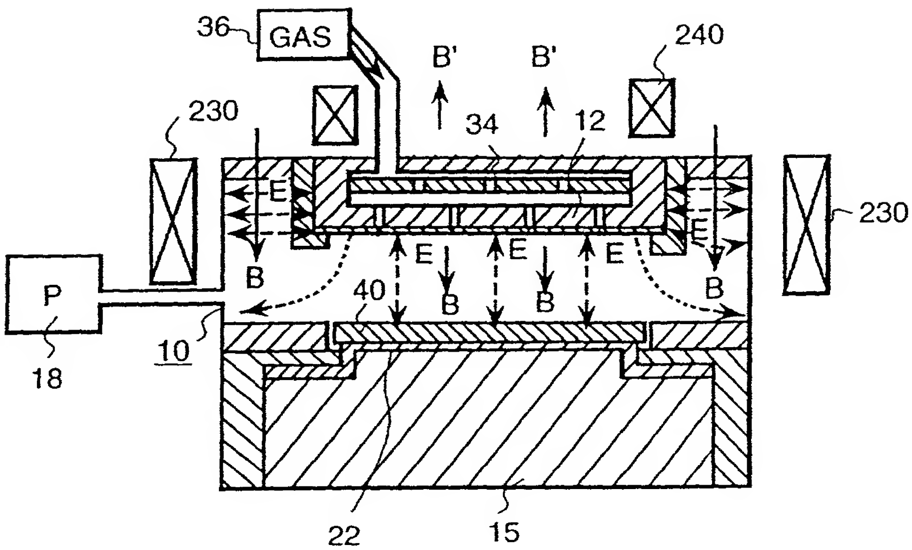

36
GAS
B'
B'
240
230
34
12
E
E
E
E
E
230
P
B
B
B
B
40
18
10
22
15

FIG. 29

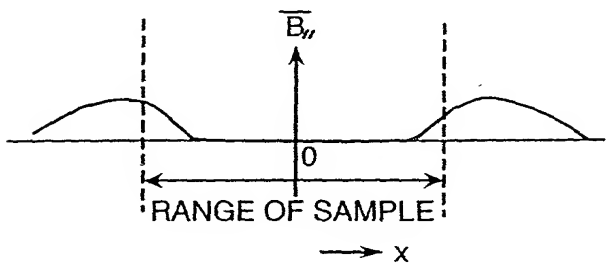

$\overline{B_{//}}$
0
RANGE OF SAMPLE
x

FIG. 30

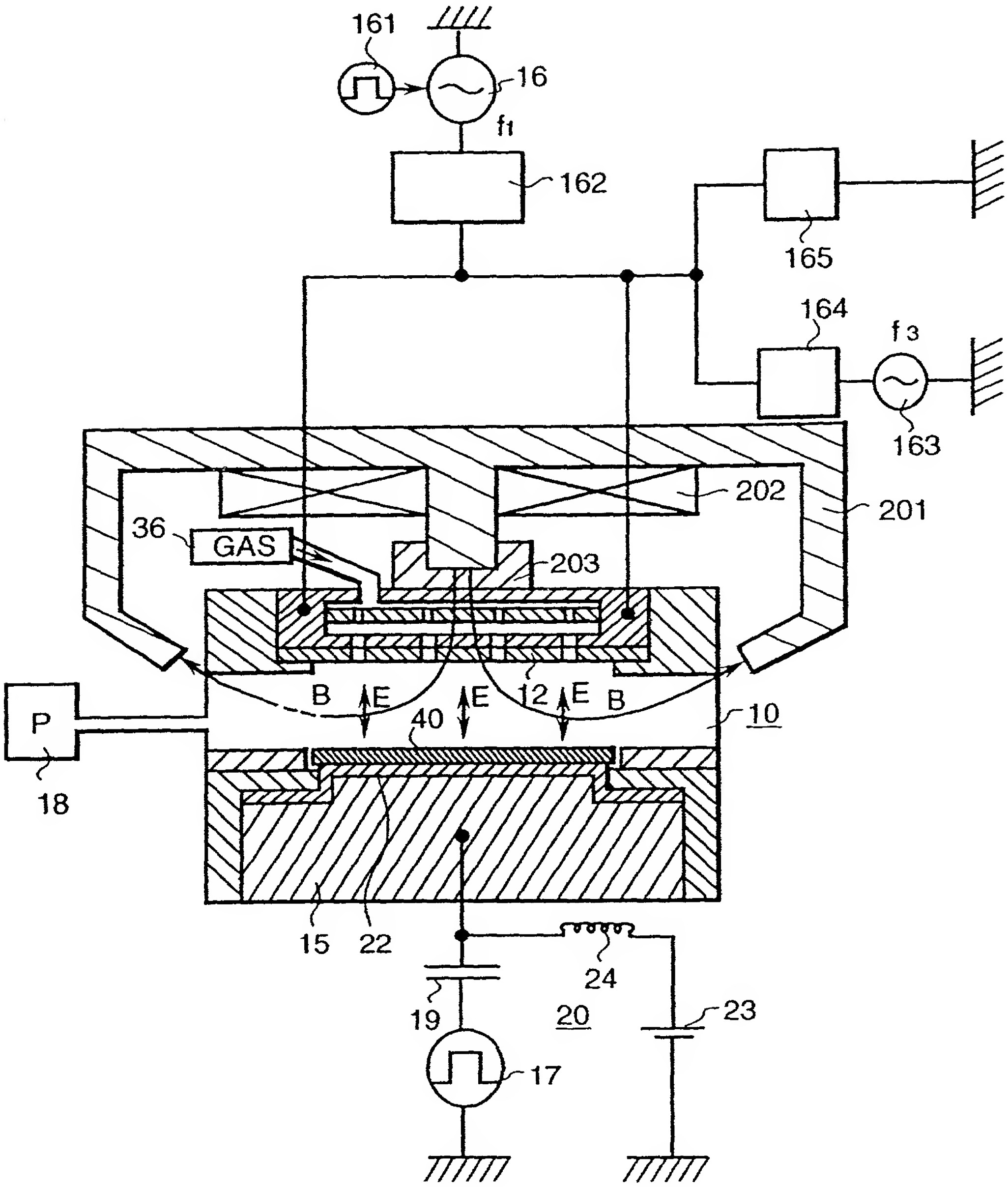

161
16
f1
162
165
164
f3
163
202
201
36
GAS
203
B
E
E
12
E
B
10
P
18
40
15
22
24
19
20
23
17

FIG. 31

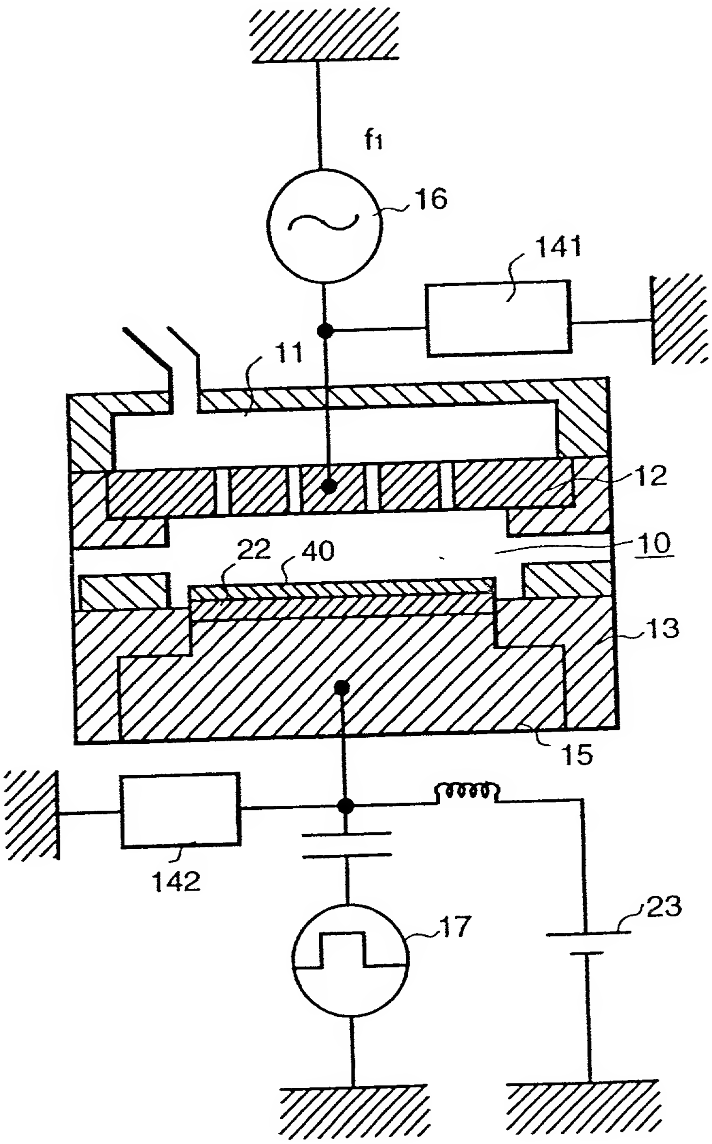
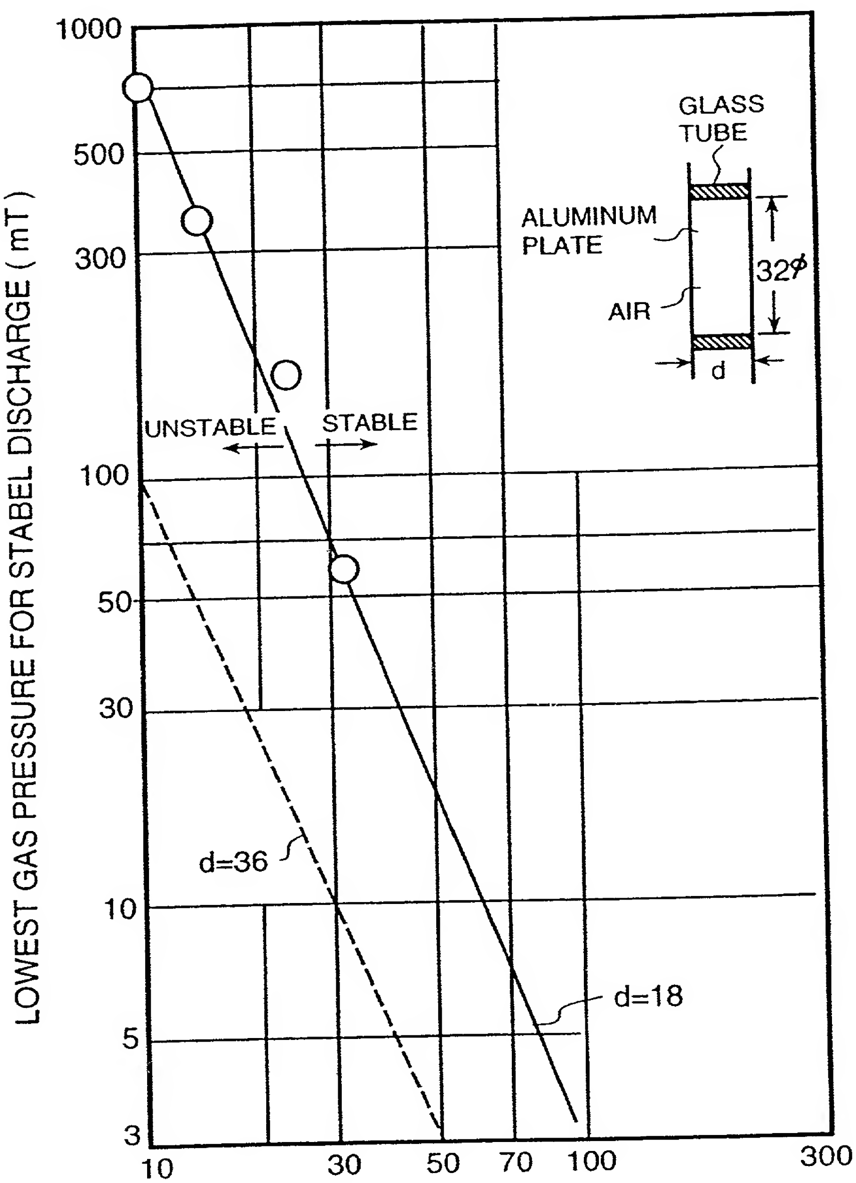


FIG. 32



FREQUENCY-LOWEST GAS PRESSURE FOR STABLE DISCHARGE CHARACTERISTC

FIG. 33

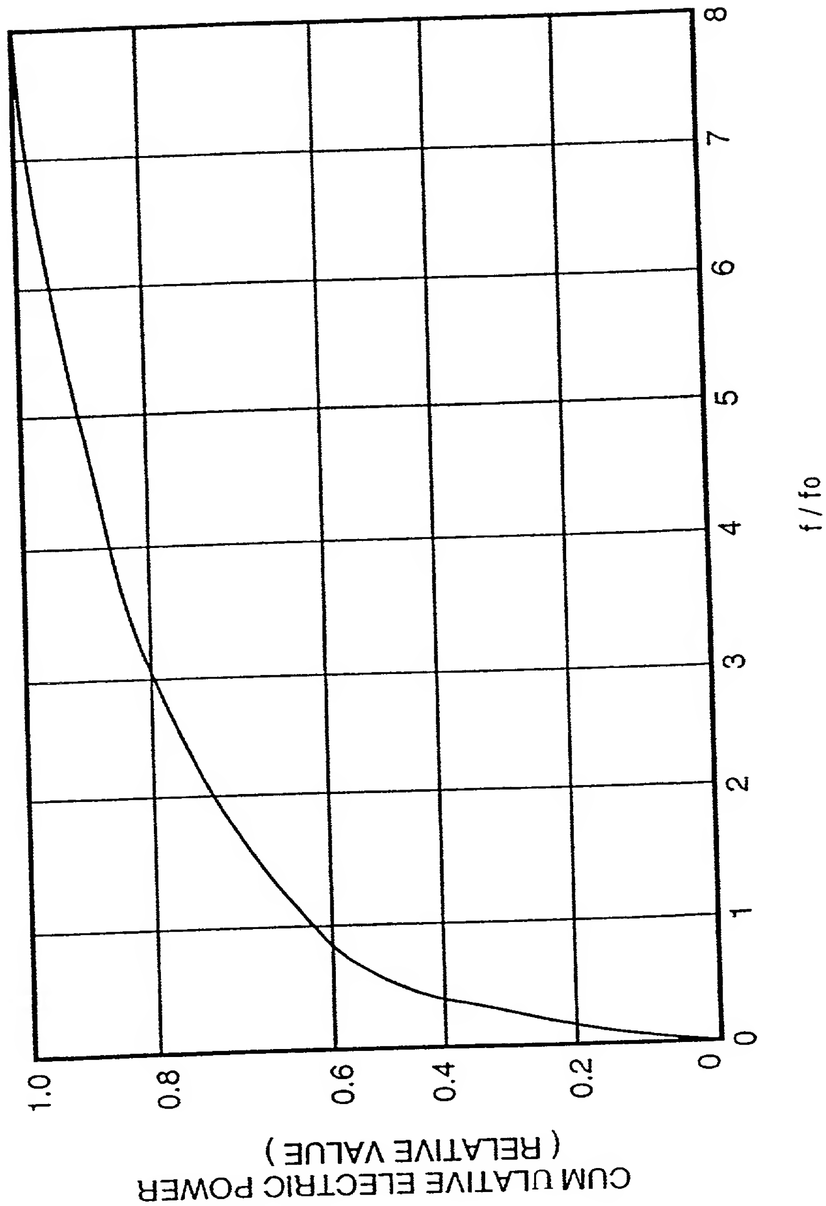

1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
7
8
f / fo
CUM ULATIVE ELECTRIC POWER
(RELATIVE VALUE)

FIG. 34

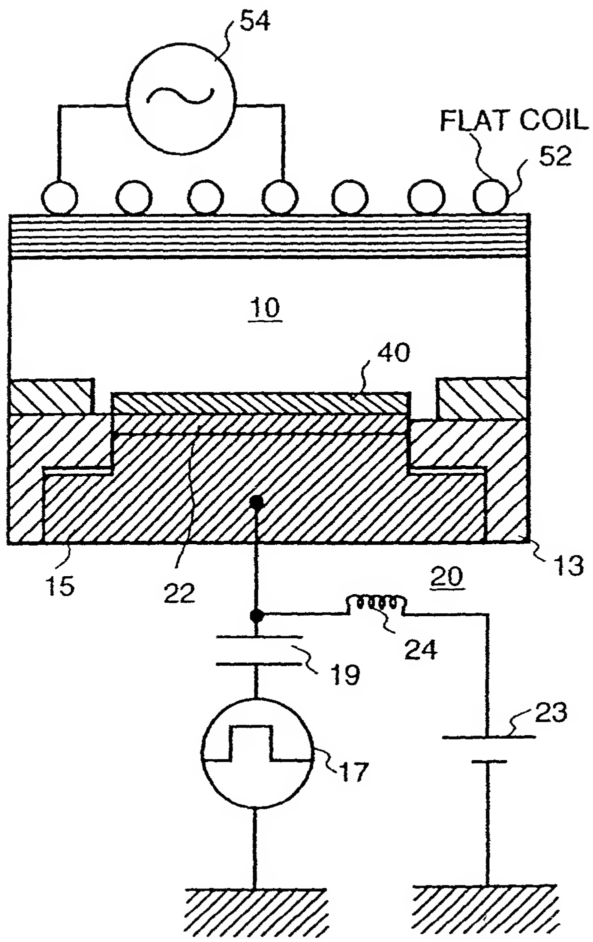


FIG. 35

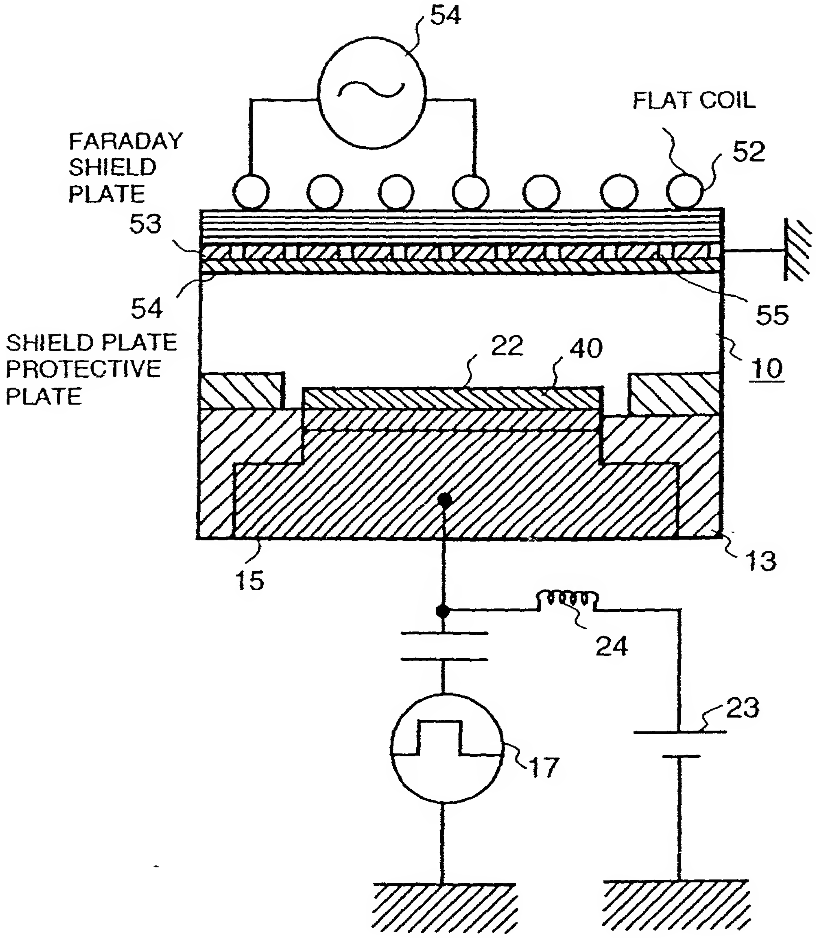

54
FLAT COIL
52
FARADAY
SHIELD
PLATE
53
54
55
SHIELD PLATE
PROTECTIVE
PLATE
22
40
10
13
15
24
23
17

FIG. 36

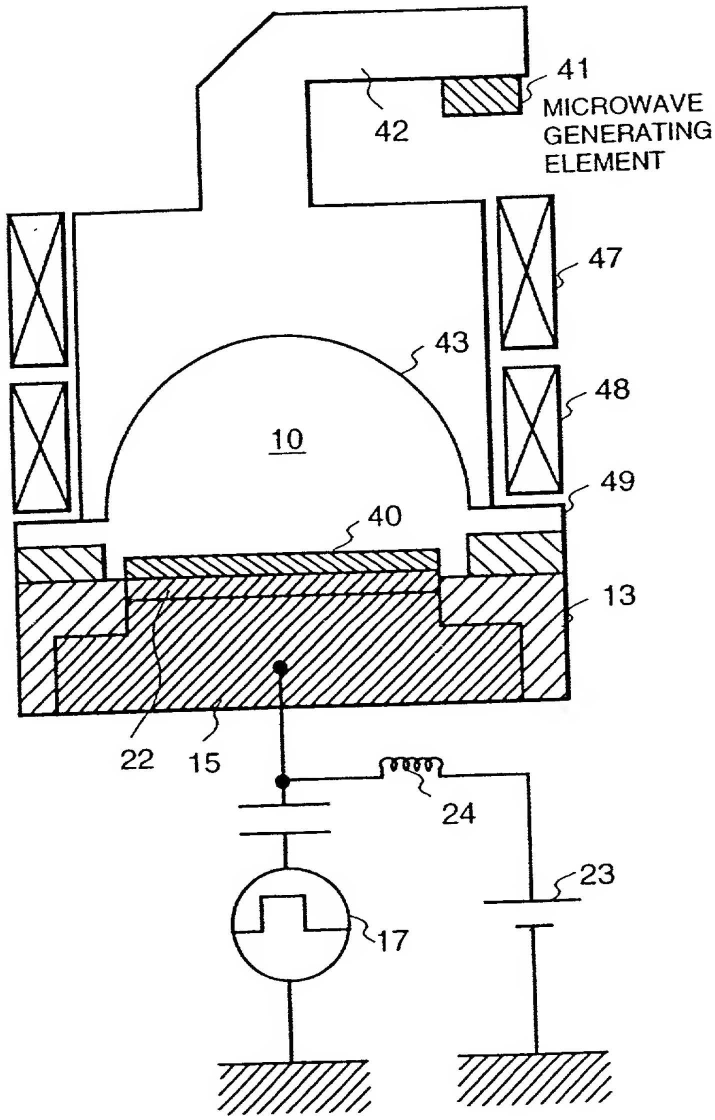

41
MICROWAVE
GENERATING
ELEMENT
42
47
43
48
10
49
40
13
22
15
24
23
17

FIG. 37

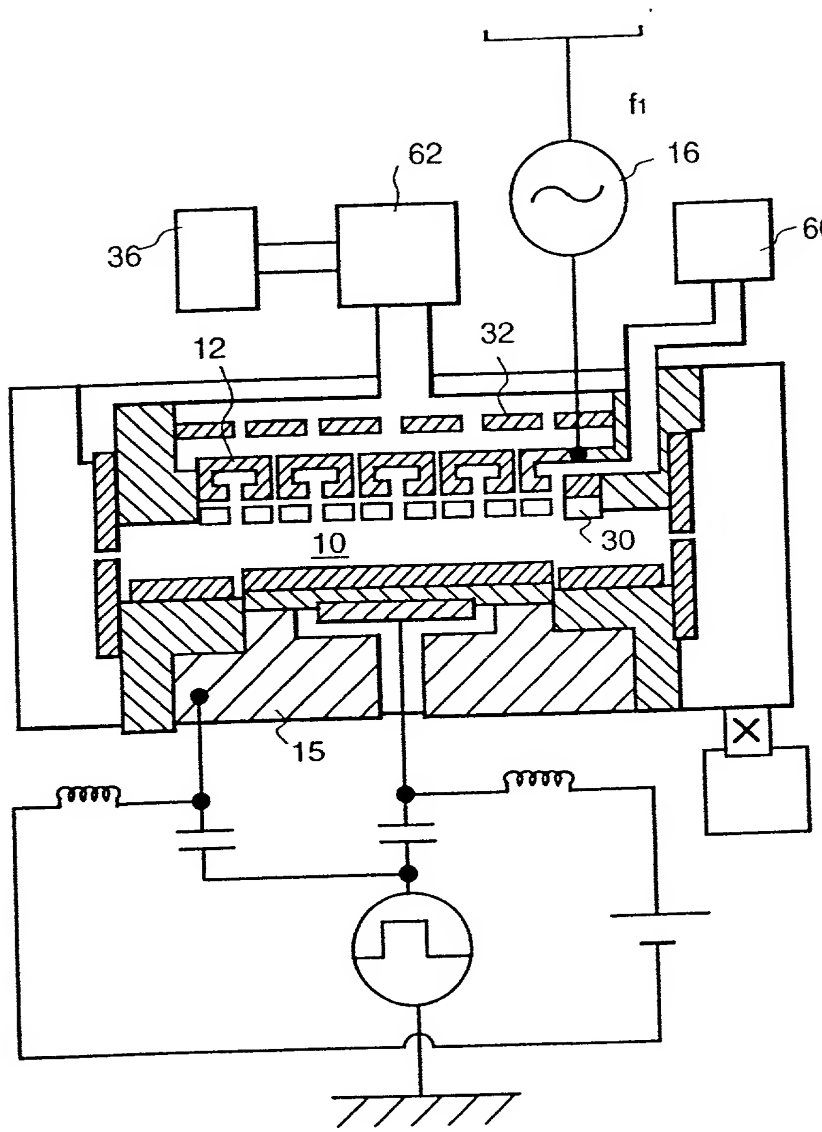


FIG. 38

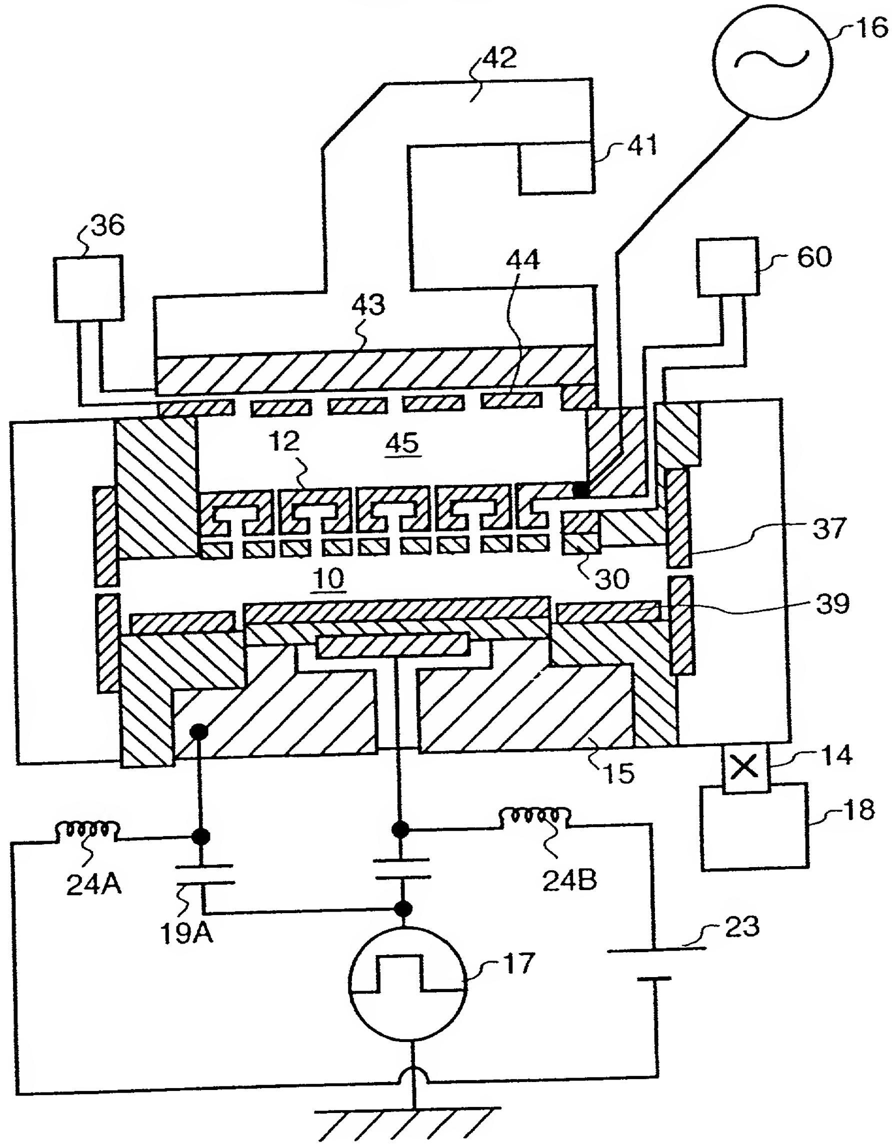


FIG. 39

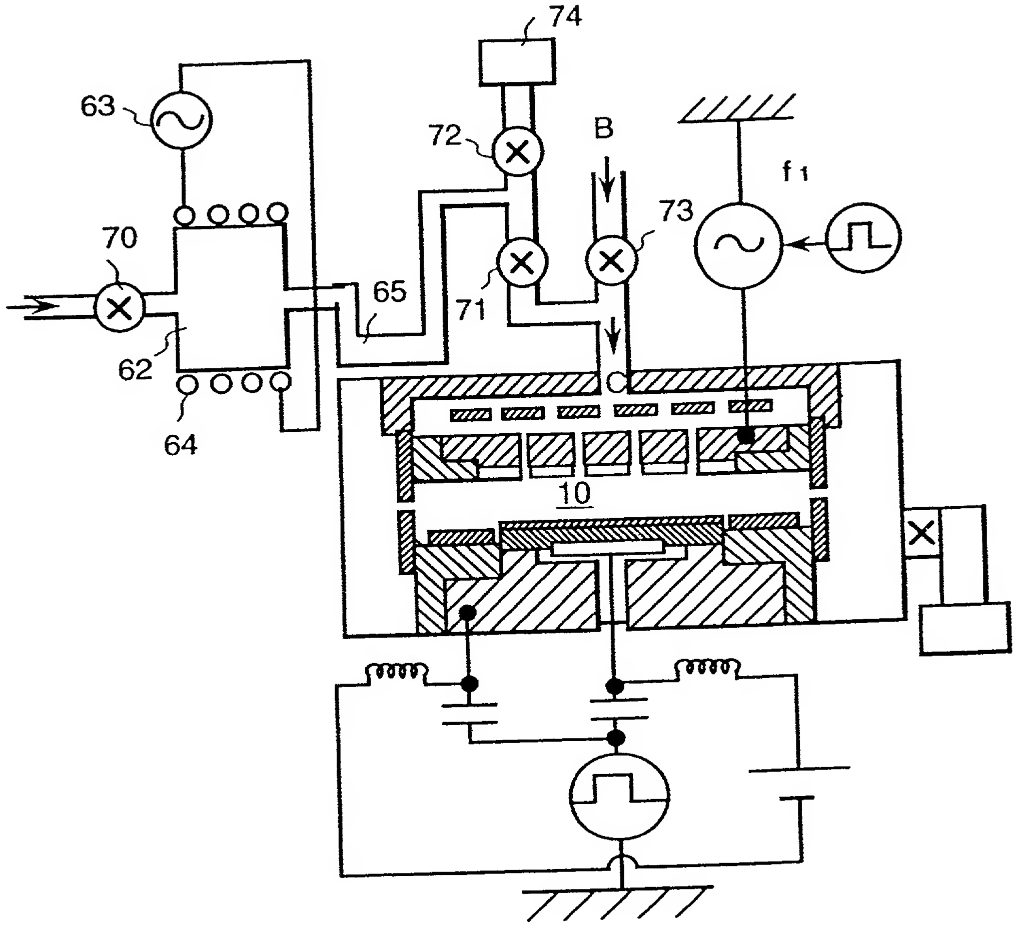


FIG. 40